

# इंटरनेट

# मानक

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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 11509-6 (2006): Methods of Test for Full-flow Lubricating Oil Filters for Internal Combustion Engines, Part 6: Cold start simulation and Hydraulic Pulse Durability Test [TED 2: Automotive Primemovers]



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“Knowledge is such a treasure which cannot be stolen”



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भारतीय मानक

आंतरिक दहन इंजनों के लिए पूर्ण प्रवाह के स्नेहन  
तेल फिल्टरों की परीक्षण पद्धतियाँ

भाग 6 कोल्ड स्टार्ट सिमुलेशन और द्रवीय स्पंद स्थायित्व परीक्षण  
( पहला पुनरीक्षण )

*Indian Standard*

METHODS OF TEST FOR FULL-FLOW  
LUBRICATING OIL FILTERS FOR INTERNAL  
COMBUSTION ENGINES

PART 6 COLD START SIMULATION AND HYDRAULIC PULSE DURABILITY TEST

( *First Revision* )

ICS 27.020

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**BUREAU OF INDIAN STANDARDS**

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NATIONAL FOREWORD

This Indian Standard (Part 6) (First Revision) which is identical with ISO 4548-5 : 1990 'Methods of test for full-flow lubricating oil filters for internal combustion engines — Part 5 : Cold start simulation and hydraulic pulse durability test' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Automotive Primemovers Transmissions, Steering Systems and Internal Combustion Engines Sectional Committee and approval of the Transport Engineering Division Council.

The Sectional Committee decided to align the Indian Standard with the corresponding International Standard wherever feasible and wherever the domestic considerations were not so intense so as to have standards different from the ISO Standards. This decision was taken with a view to upgrade the quality of the products in line with the International Standards.

This standard was first published in 1986. The first revision was undertaken due to revision of base standard. The following technical changes have been incorporated:

- a) Scope has been elaborated.
- b) Clause on:
  - 1) Reference has been included.
  - 2) Operational characteristics to be tested.
  - 3) Table on values of pressure on different type of filter cum category of oil filters.
  - 4) Hydraulic pulse durability test is included.
  - 5) Cold start simulation test is revised.

The text of the ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standards' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma ( , ) has been used as a decimal marker while in Indian Standards, the current practice is to use a point ( . ) as the decimal marker.

In this adopted standard, reference appears to the following International Standard for which Indian Standard also exists. The corresponding Indian Standard which is to be substituted in its place is given below along with its degree of equivalence for the edition indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 4548-1 : 1982 Methods of test for full-flow lubricating oil filters for internal combustion engines — Part 1 : Pressure drop/flow characteristics	IS 11509 (Part 1) : 1985 Methods of test for full-flow lubricating oil filters for internal combustion engines: Part 1 Pressure drop/flow characteristics	Technically Equivalent

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard*

**METHODS OF TEST FOR FULL-FLOW  
LUBRICATING OIL FILTERS FOR INTERNAL  
COMBUSTION ENGINES**

**PART 6 COLD START SIMULATION AND HYDRAULIC PULSE DURABILITY TEST**

*( First Revision )*

## **1 Scope**

This part of ISO 4548 specifies a method of testing the ability of full-flow lubricating oil filters for internal combustion engines to withstand an internal pressure surge such as occurs when an engine is started from cold, and cyclic internal pressure variations experienced during operation.

These tests are intended for application to spin-on type filters and detachable filters with disposable elements with a maximum flow rate of 100 l/min. The tests may be applied to other filters if thought applicable by agreement between the filter manufacturer and the purchaser.

NOTE 1 This test is not intended to replace simulated environmental testing (e.g. at very low temperatures). If such testing is required, it should be the subject of negotiation between the supplier and customer.

## **2 Normative reference**

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 4548. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4548 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4548-1:1982, *Methods of test for full-flow lubricating oil filters for internal combustion engines — Part 1: Pressure drop/flow characteristics.*

## **3 Definitions and graphical symbols**

### **3.1 Definitions**

For the purposes of this part of ISO 4548, the definitions given in ISO 4548-1 apply.

### **3.2 Graphical symbols**

The graphical symbols used in this part of ISO 4548 are in accordance with ISO 1219 [1].

## **4 Operational characteristics to be tested**

Filters are subjected in service to pressure fluctuations caused by engine cold starting conditions. The test specified in clause 7 verifies the ability of the filter canister and seal to withstand these high pressure fluctuations for a given number of start conditions.

Filters are also subjected to cyclic pressure variations during normal operation. The test given in clause 8 verifies the ability of the filter canister and seal to withstand these pressures for a given number of cycles.

## **5 Test rig**

The test rig shall comprise the following components, together with the necessary tubing, connectors and supports (see figure 1):

- a) oil reservoir;
- b) pump assembly;
- c) filter to be tested;

- d) inlet pressure control valve;
- e) solenoid valves;
- f) outlet pressure control valve;
- g) pressure gauge;
- h) solenoid sequence timer and counter;
- i) cooling coils (heat exchanger);
- j) thermostat (to operate the cut-out switch).

NOTE 2 An alternative test rig which produces the pressure pulse waveforms shown in figure 2 may be used.

## 6 Test liquid

The test liquid shall be oil with a kinematic viscosity of  $10 \text{ mm}^2/\text{s} \pm 5 \text{ mm}^2/\text{s}$  ( $10 \text{ cSt} \pm 5 \text{ cSt}$ ) throughout the test [viscosity class ISO VG22 at  $63^\circ\text{C}$  or SAE 5W at  $68^\circ\text{C}$  (see [2] and [3])].

## 7 Cold start simulation test (see figure 1)

7.1 Fit the filter on an appropriate adaptor and apply the filter manufacturer's recommended tightening torque or angle of rotation for the filter to be tested.

7.2 Connect the test adaptor to the pipework system of the test rig.

7.3 Start the pump, ensuring that regulating valves ④ and ⑦ and solenoid valves ⑤ and ⑥ are fully open.

7.4 Allow the rig to run until all air has been purged from the system. Close solenoid valves ⑤ and ⑥ and adjust valve ④ until the pressure agreed with the engine manufacturer is obtained. In the absence of such an agreement, one of the values given in annex A shall be used.

Switch on solenoid valves ⑤ and ⑥ to obtain a pressure waveform as indicated in figure 2. Valve ⑦ shall be adjusted to give a pressure differential of 0,1 bar to 0,2 bar to avoid negative pulses of outlet pressure. Any further adjustments during the test should be made as necessary during periods when solenoid valves ⑤ and ⑥ are closed. An oscilloscope or an alternative device shall be provided to monitor the pressure waveform and cycle times.

7.5 Set the counter to zero.

7.6 Open the inlet and return valves of the water cooling system and adjust the water flow to regulate the reservoir oil temperature to maintain the required viscosity (see clause 6).

7.7 Allow the test to continue, making visual checks for signs of failure at frequent intervals, until failure occurs or until the number of cycles agreed with the engine manufacturer has been applied. In the absence of such an agreement, the value given in annex A for the test pressure chosen shall be used.

7.8 To stop the test, fully open valve ④ and switch off the pump and the solenoid valve control switch.

7.9 Check and record the tightening torque (i.e. turn in the tightening direction).

7.10 Remove the filter, allow to drain, and visually examine the unit to determine the failure point and type of failure, if any.

## 8 Hydraulic pulse durability test (see figure 1)

8.1 Fit a new filter on an appropriate adaptor and apply the filter manufacturer's recommended tightening torque or angle of rotation for the filter to be tested.

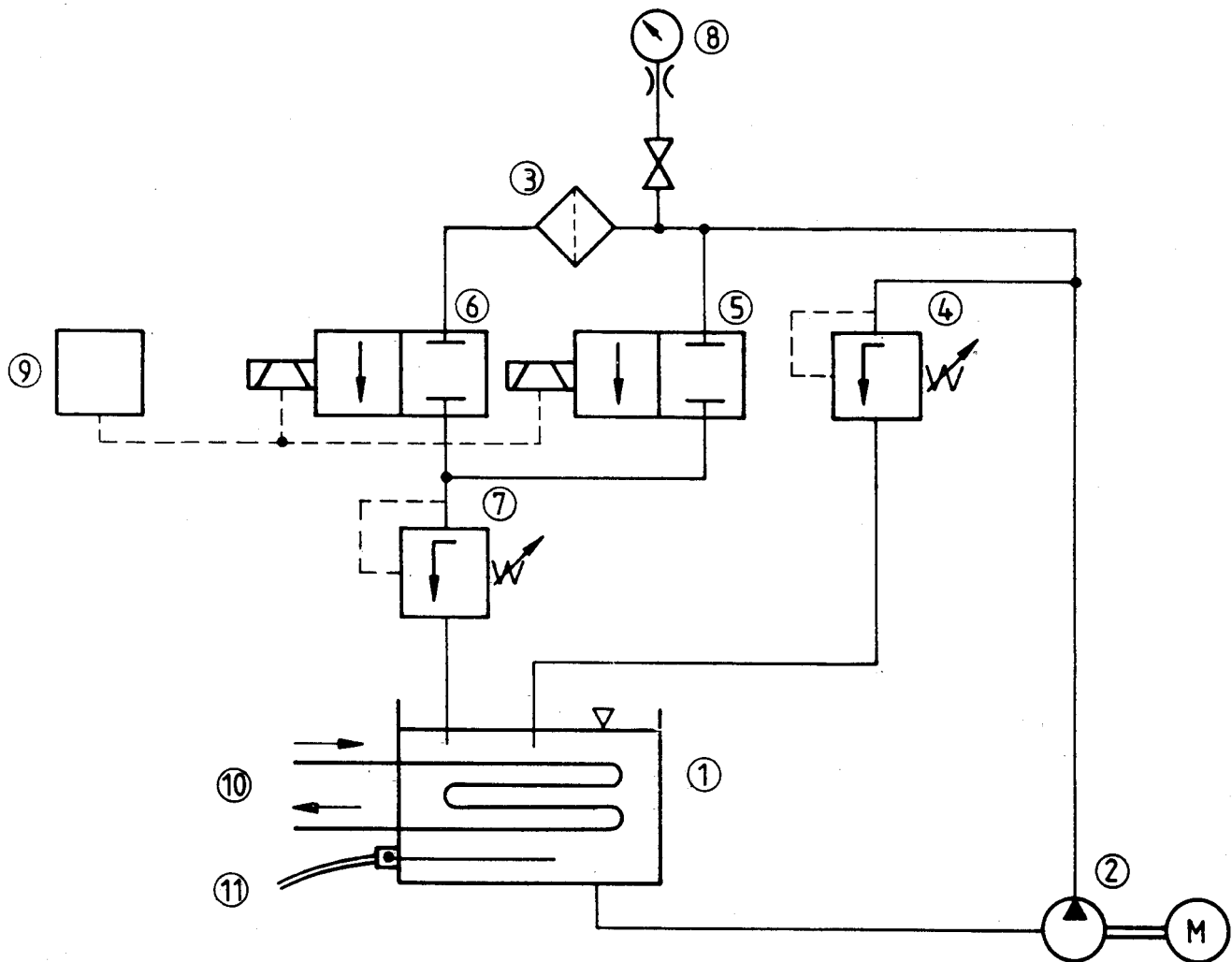
8.2 Connect the test adaptor to the pipework system of the pulse test rig.

8.3 Start the pump, ensuring that regulating valves ④ and ⑦ and solenoid valves ⑤ and ⑥ are fully open.

8.4 Allow the rig to run until all air has been purged from the system. Close solenoid valves ⑤ and ⑥ and adjust valve ④ until the pressure agreed with the engine manufacturer is obtained. In the absence of such an agreement, the value given in annex A for the appropriate category shall be used.

Switch on solenoid valves ⑤ and ⑥ to obtain a pressure waveform as indicated in figure 2. Valve ⑦ shall be adjusted to give a pressure differential of 0,1 bar to 0,2 bar to avoid negative pulses of outlet pressure. Any further adjustments during the test should be made as necessary during periods when solenoid valves ⑤ and ⑥ are open or closed. An oscilloscope or an alternative device shall be provided to monitor the pressure waveform and cycle times.

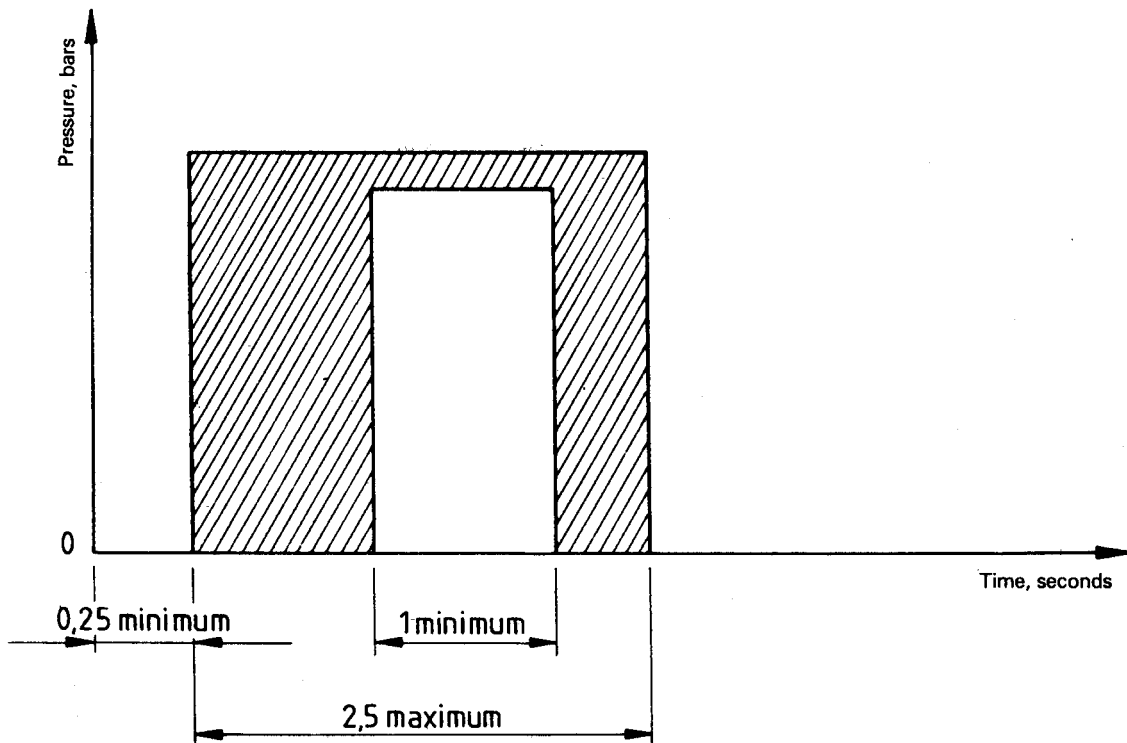
8.5 Set the counter to zero.



- Key**
- ① Oil reservoir
  - ② Pump assembly
  - ③ Filter to be tested
  - ④ Inlet pressure control valve
  - ⑤ Solenoid valve
  - ⑥ Solenoid valve
  - ⑦ Outlet pressure control valve
  - ⑧ Pressure gauge
  - ⑨ Solenoid sequence timer and counter to operate valves ⑤ and ⑥
  - ⑩ Cooling coils (heat exchanger)
  - ⑪ Thermostat (to operate the cut-out switch)

**Figure 1 — Test rig for cold start simulation and hydraulic pulse test**





**Figure 2 — Diagrammatic pressure pulse waveform for the cold start simulation test and for the hydraulic pulse durability test**

**8.6** Open the inlet and return valves of the water cooling system and adjust the water flow to regulate the reservoir oil temperature to maintain the required viscosity (see clause 6).

**8.7** Allow the test to continue, making visual checks for signs of failure at frequent intervals, until failure occurs or until the number of cycles agreed with the engine manufacturer has been applied. In the absence of such an agreement, the value given in annex A for the appropriate category shall be used.

**8.8** To stop the test, fully open valves ④ and ⑦ and switch off the pump and the solenoid valve control switch.

**8.9** Check and record the tightening torque (i.e. turn in the tightening direction).

**8.10** Remove the filter, allow to drain, and visually examine the unit, after dismantling if necessary, to determine the failure point and type of failure, if any.

## 9 Test report

The test report shall include at least the following:

- the name of the test establishment;
- the filter type (manufacturer, model number and batch number);
- the date of the test;
- a description of the filter and whether it is new or used; if it is used, the approximate period of service;
- the category of filter (see annex A);
- the rated flow, in litres per minute;
- the test pressure, in bars (see 7.4 and 8.4);
- the mode of failure and its location;
- the torque applied initially and at the end of the test, in newton metres (see 7.1 and 7.9, 8.1 and 8.9);
- the number of cycles to failure or the number of cycles completed (see 7.7 and 8.7).

## Annex A (normative)

### Values to be used for tests if no agreement is reached with the manufacturer

Table A.1 gives the pressure and number of cycles to be used in the cold start simulation test and the hydraulic pulse durability test for the chosen category of filter.

**Table A.1**

Filter type	Category	Cold start simulation test		Hydraulic pulse durability test	
		Pressure bar	Number of cycles	Pressure bar	Number of cycles
Spin-on	A	$10 \pm 0,3$	1 000	$5 \pm 0,2$	25 000
Spin-on	B	$13 \pm 0,3$	3 000	$7 \pm 0,2$	50 000
Detachable with disposable element	C	$16 \pm 0,5$	5 000	$9 \pm 0,3$	75 000

**Annex B**  
(informative)

**Bibliography**

- [1] ISO 1219:1976, *Fluid power systems and components — Graphic symbols*.
- [2] ISO 3448:1975, *Industrial liquid lubricants — ISO viscosity classification*.
- [3] SAE J300c, *Engine oil viscosity classification*.

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : TED 2 (476).

Amendments Issued Since Publication		
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